



**Seventh General Assembly of the ILRS
April 25, 2002
Nice, France**

Presentation Material



Network Reports

WLRs:

- fully operational (SLR) since January 2002
- improvements:
 - Event Timer (French Development(Dassault))
 - Improvement in Calibration
 - extension to low orbiting satellites (Champ, ..)
 - second receiving telescope with detector
 - integration of the resp. calibration features

TIGO-SLR

- since January in Concepcion
- since mid of April operational
- first passes have been tracked

MTLRs

- still idle
- waiting for decisions to move on with the cooperation with the Urumqi Astronomical observatory

EUROLAS: Station reports

- FTLRS
- Wetzell
- Graz
 - Range gate generator with < 0.5 ns resolution
 - Designed for multi-kHz Laser systems
- Zimmerwald
 - Very preliminary tests with infrared ranging (846 nm)
 - Hamamatsu PM
 - Better return rate, less day light noise, slightly higher single-shot RMS
- Matera

French Transportable Laser Station in operation

Colocation phase at Grasse observatory

Three stations (Fixed SLR, LLR and FTLRS)

September 2001 -> December 2001

Results:

-60 simultaneous passes on Lageos with three stations

-more than 120 LEOS satellites with two stations

-> Ftlrs qualification



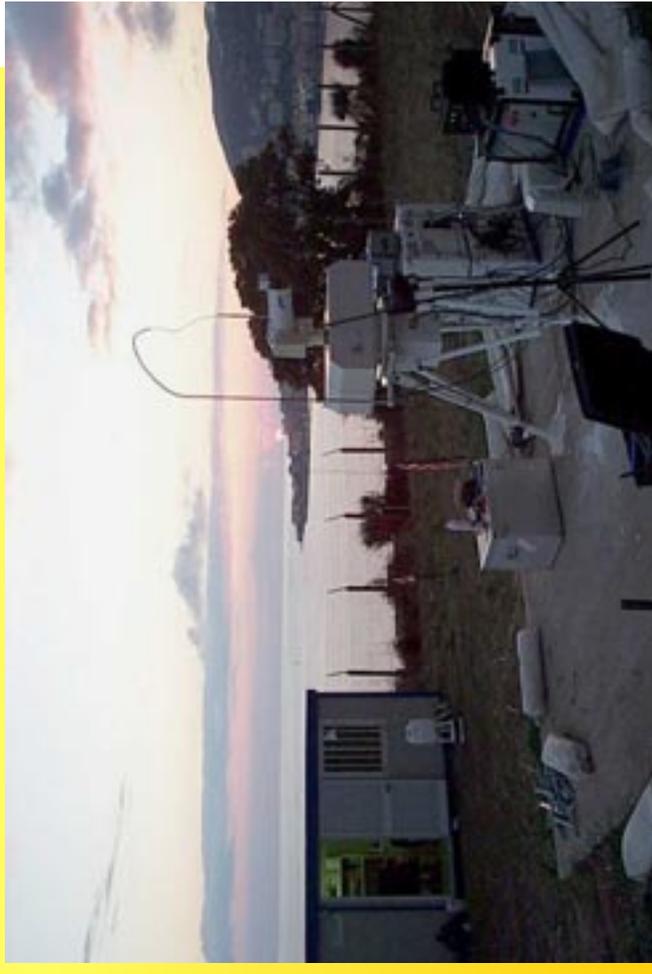
Jason1 calibration campaign

Installation on January 15th 2002 in Corsica
at Ajaccio

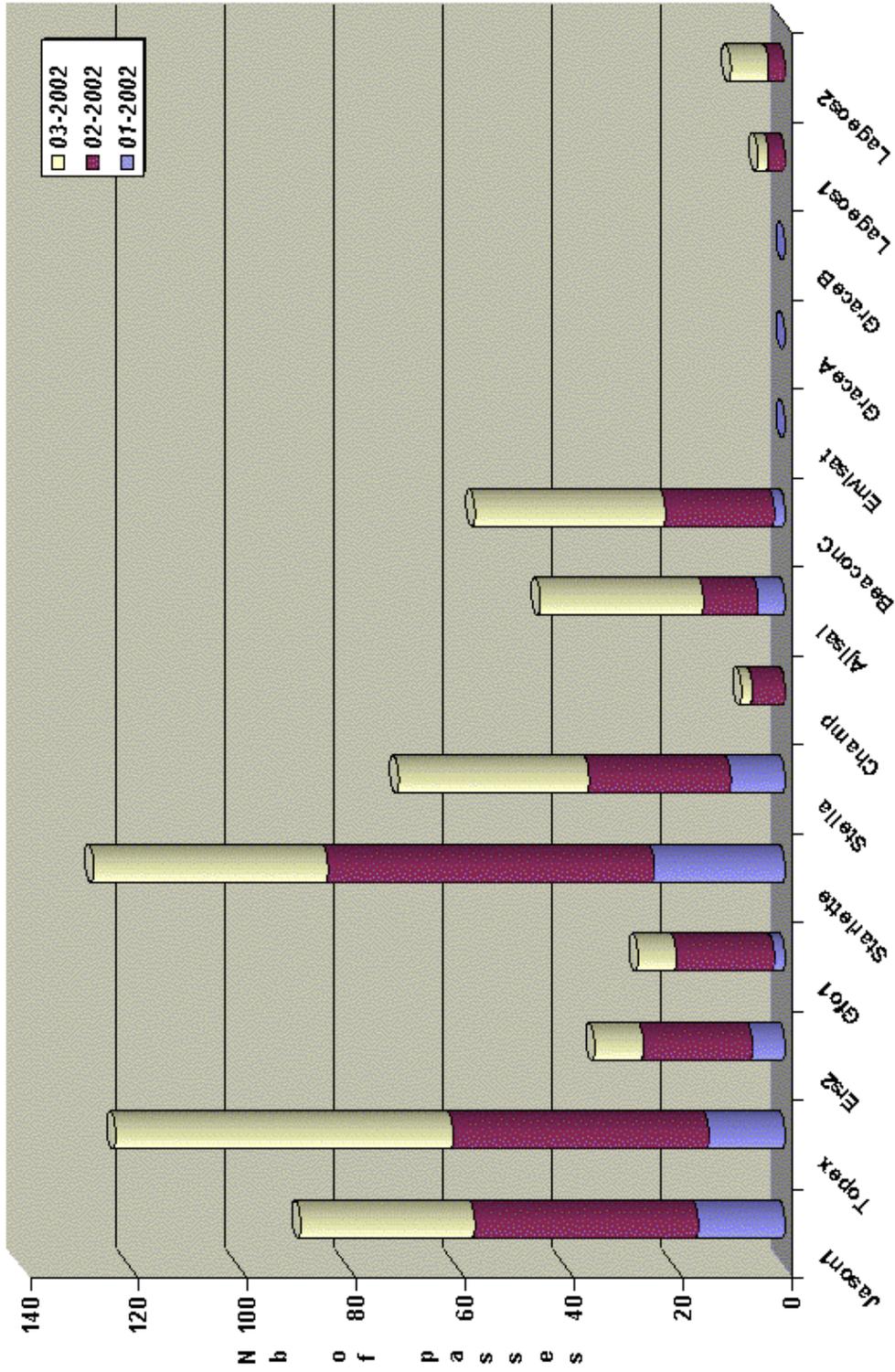
Jason1 calibration pass every ten days

More than 600 passes in three months

End of this campaign July 2002



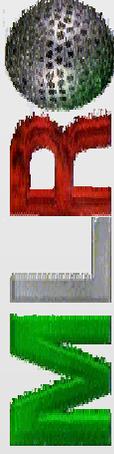
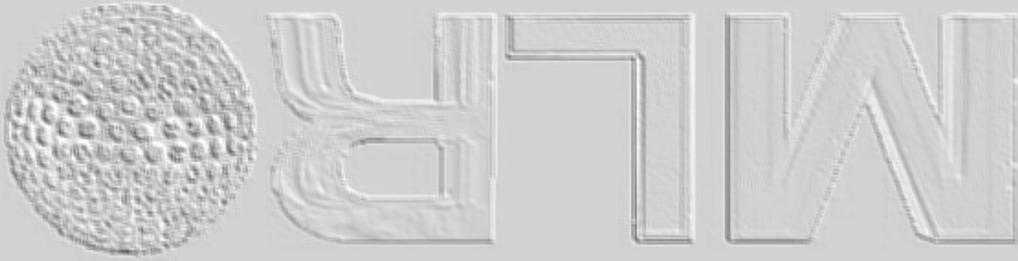
FTLRS Ajaccio - 01-13-2002 => 03-31-2002



FTLRS at Ajaccio (Corsica)



Ajaccio-campagne d'étalonnage Jason1 janvier/juin 2002



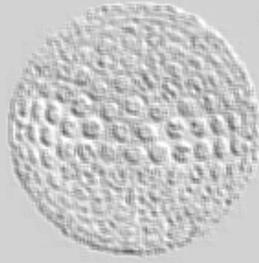
Status report

G. Bianco
ASI/CGS, Matera, Italy

7th ILRS General Assembly
Nice, France, 25 April 2002

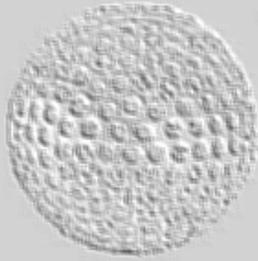
MLRO status report

- ◆ System is producing good quality data
- ◆ 2-color PMT configuration operational
- ◆ 2-color streak camera configuration operational (several passes tracked)
- ◆ LLR configuration operational (Moon tracked)
- ◆ Ready to go into final acceptance at any time now

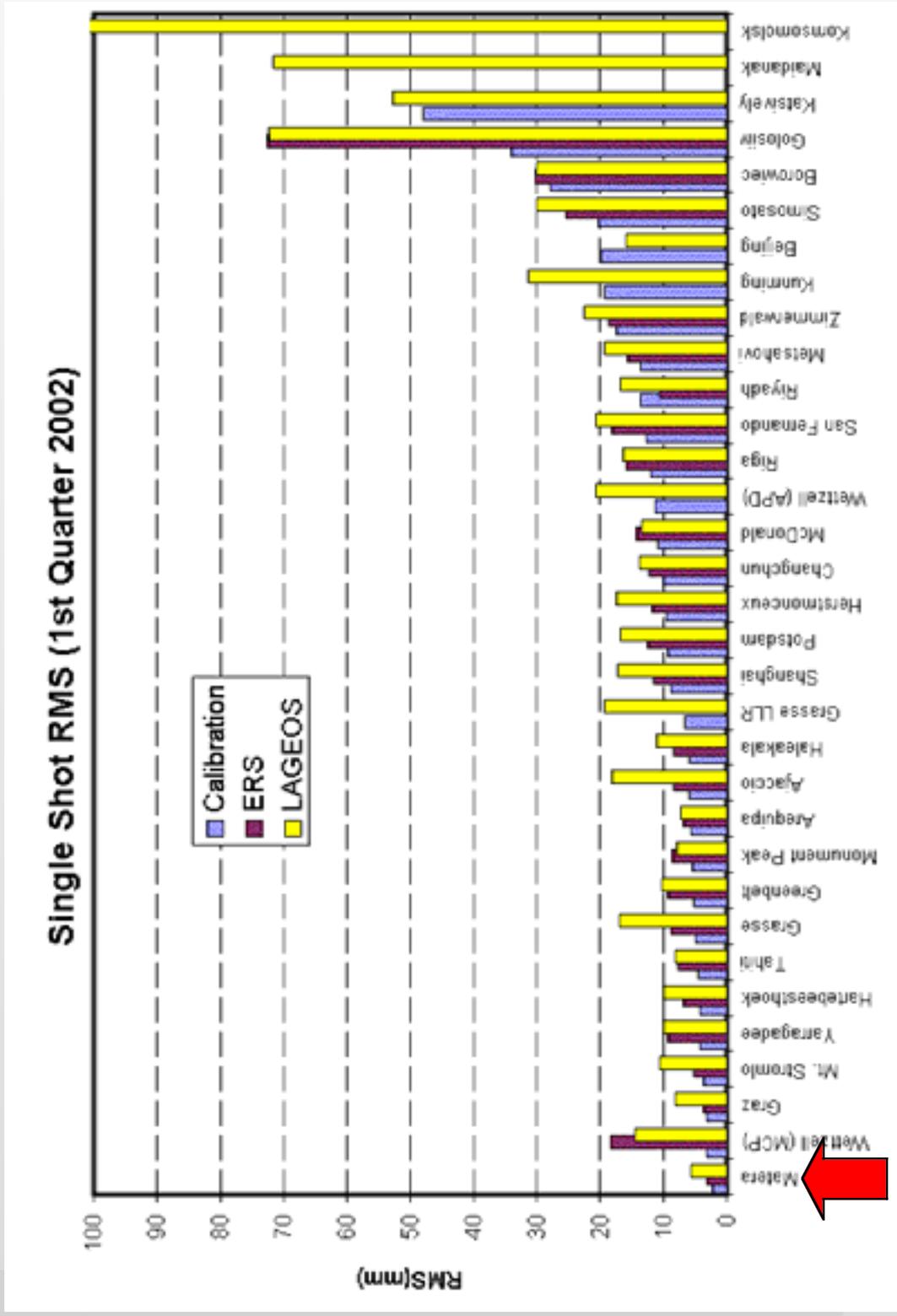


MLRO

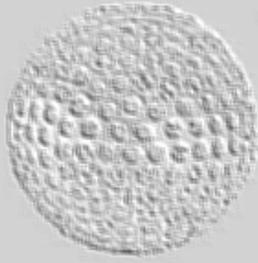
In case you missed this, we're here....



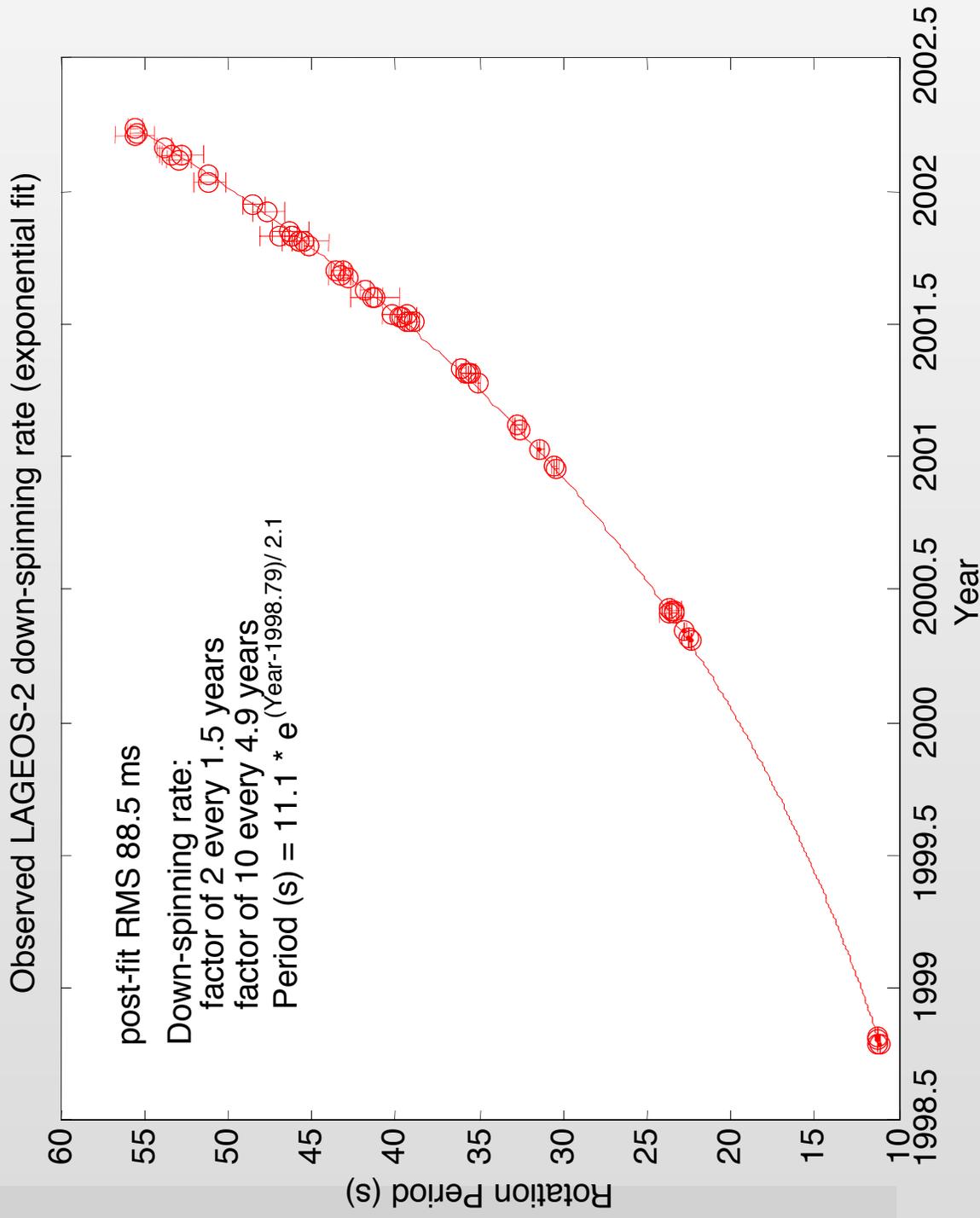
MLR



LAGEOS II down-spinning rate



IRW



WPLTN Report

ILRS Seventh General Assembly

Nice, France
April 25, 2002

ABSTRACTS:

Australian Network

The Australian stations Stromlo (7849) and Yarragadee (7090) are performing well. Stromlo routinely operates autonomously and unattended for 80 hours every week, without problems.

The LIDAR system at Yarragadee is to be upgraded slightly to provide enhanced data to atmospheric physicists. The definitive report on the local ties at Stromlo, Yarragadee, Orroral, Hobart and Tidbinbilla has been published.

AUSLIG has been re-organised within the Australian Government administration, and is now called the National Mapping Division of Geoscience Australia. SLR funding faces an uncertain future in Australia.

Chinese Network

The performance of the Chinese stations has not been changed since last Laser Workshop. But many problems have happened recently. The Beijing station has laser problem, the Wuhan station has the problem with the new dome, the Kunming station has problem with their detectors. Each station is making effort to solve the problems.

The SLR system for Argentina is still under construction. It will be finished by the fall of this year, but not including the installation in San Juan, Argentina.

Japanese Network

The KSP(CRL) station at Miura was dismantled in January 2001 and the telescope was moved to the University of Kagoshima. Observation from other KSP stations are suspended, pending allocation of funds under the next budget.

JHD has submitted to CDDIS outstanding data obtained in by HTLRS during the 1990's occupation of a remote island in Japan.

Simosato station has been in trouble with mount motors [now replaced], while LEO productivity increased by increased efforts in satellite acquisition with lower minimum elevation angle and working shift optimisation.

NASDA new SLR station of GUTS project is under development in a southern island near launching site, and is now in CDR phase.

Russian Network

Komsomolsk [1868] will stop operation from June 2002 to the end of 2002, for modernization (telescope, tracking system, laser, distance measurement system). Maidanak [1863] will be operational in mid 2002. Maidanak [1864] and Mendeleev [1870] are operational.

REFLECTOR and METEO were launched.

The new SLR station near Moscow is seeking permission for the publication of its station coordinates.

Saudi Arabia

SALRO has re-started observation and to send data to CDDIS in January 2001 with considerably high volume of passes from low satellites to high satellites including GPS. Effort to bring the station to a fully operational status continues.

SALRO symposium [to be held on 23-24 September 2001] was deferred indefinitely due to the events of September 11, 2001.

DETAILED NATIONAL REPORTS

1. Russia

1868, Komsomolsk:

It is planned to stop the station operation from June, 2002 till the end of 2002, for modernization (telescope, tracking system, laser, distance measurement system).

1863, Maidanak

The tracking system is under upgrading. Possibly the station will be operational in April, 2002.

1864, Maidanak, and 1870, Mendeleevo

Operational

SLR station near the Moscow

The station makes regular ranging measurements, but we still have no permission for the station's participation in the ILRS; we continue our efforts to obtain such a permission.

The MCC-M is regularly making estimations of the station's ranging precision (see below in Attachment 1).

Besides this, IPIE is currently conducting several experiments in space, to solve some SLR problems.

Spherical retroreflector on board of the METEOR-3M(1) satellite

Most of the passive SLR satellites have been launched during the years when the SLR station equipment provided an accuracy of several centimeters. But now, with the new equipment providing an accuracy of several millimeters, the systematic target errors caused by the retroreflector design and their distribution over the satellite surface are limiting the distance measurement precision.

On board of the METEOR-3M(1) satellite, a novel-type retroreflector is installed, having an unique design based on the spherical Luneberg lens principle. It has a spherical symmetry, and a constant CoM correction value with an accuracy of about ± 0.02 mm. In contrary to currently used cube corner prism retroreflectors, this retroreflector has a practically zero target error.

Starting from December, 2001, a joint experiment is conducted by GSFC and IPIE on laser ranging of the "Optical Luneberg Lens" on board of the METEOR-3M(1) spacecraft. Two American SLR stations (Greenbelt and Monument Peak) and one Russian station near Moscow are taking part in the experiment. The limited number of stations participating in the experiment was caused by fear that laser light may cause interference during operation of the SAGE instrument installed by NASA on board of the METEOR-3M(1) spacecraft. Currently all the limitations have been lifted, and we are asking the ILRS for support of the METEOR-3M(1) mission with the spherical retroreflector on board.

From the measurement results obtained by the three SLR stations above (10 passes) it can be seen that the return signal strength is in accordance with the predicted values. Thus it is possible to initiate, during the ILRS meeting, a discussion on a future launching of an autonomous spherical satellite-retroreflector, and on a search for sponsors for such a launching. A satellite 22 cm in diameter (mass of about 15 kg) could be a good target with a

sufficient cross-section and a near-zero target error. The cost of such a satellite, with an account for the separation device and the launching, will be about 600,000 USD. The launching of such a satellite will not only serve for development of investigations in crustal dynamics, but will also stimulate further developments of more precise SLR equipment.

REFLECTOR microsatellite

December 10, 2001, as a piggyback load on the METEOR-3M(1) spacecraft, the REFLECTOR microsatellite has been put into orbit.

The REFLECTOR microsatellite is a passive test object comprising several groups of retroreflectors placed into specified points of the object. It is intended for investigations of resolving power of large-size ground-based telescopes with laser illumination of the target, used to obtain images of “space debris”, as well as for determination of spatial attitude of spacecraft by precise ranging with use of multistop time interval counters.

IPIE asked ILRS for support of the REFLECTOR mission, and the CB of ILRS responded positively. The first SLR observations of the REFLECTOR satellite were made by the Yarragadee station. Currently we are using the FR data available from NASA stations, as well as FR data kindly provided by the Herstmonceau station team, to investigate the satellite orientation status and to determine its oscillation damping parameters.

2. China

The fixed stations at Changchun, Shanghai, Beijing and Kunming have been routinely operational. The window of the dome at Wuhan station was broken and had been rebuilt last year, and the station will start observation soon.

The system stability including both short term and long term stability for all stations has been paid more attention. Some data from these stations were still edited in the analysis reports published by the UTX/CSR due to the large range bias.

These stations would like to ask for assistance from the Network and Engineering Working Group and the Analysis Working Group to identify and eliminate system biases.

The Shanghai station has had a fixed bias -40 mm for some years and -80 mm since July 2001 in the UTX/CSR reports. In order to identify the biases, K.Hamal and I.Prochazka of the Czech Technical University brought a portable Pico Event Timer and the independent data acquisition and processing software package to Shanghai and carried out the calibration comparative experiment during August 16-22, 2001 [Results attached].

The joint team has measured 3 short distance targets and found the differences of the system delays from these targets only 2-3 mm. The P-PET calibration package was operated in parallel to the existing SLR system and has tracked 16 passes satellites. The comparison of ranging accuracy, time bias and range bias for each pass are listed in the following table. The range biases were derived from the point to point comparison with the full-rate data obtained by two systems.

No obvious biases were detected in the experiment. The conclusion we reach is that additional support from the Working Groups will be required to identify the system biases.

The mobile system TROS was moved to Urumqi, the biggest city in the northwest border and had tracked 44 passes of Lageos from April 23 to June 5, 2001. Afterwards, the TROS was moved to Lhasa, Tibet in June 2001, and left in January 2002. It had obtained 102 passes from Lageos and 129 passes from other satellites.

Chinese-Czech Joint Project, Satellite Laser Ranging

Summary of Satellite Laser Ranging

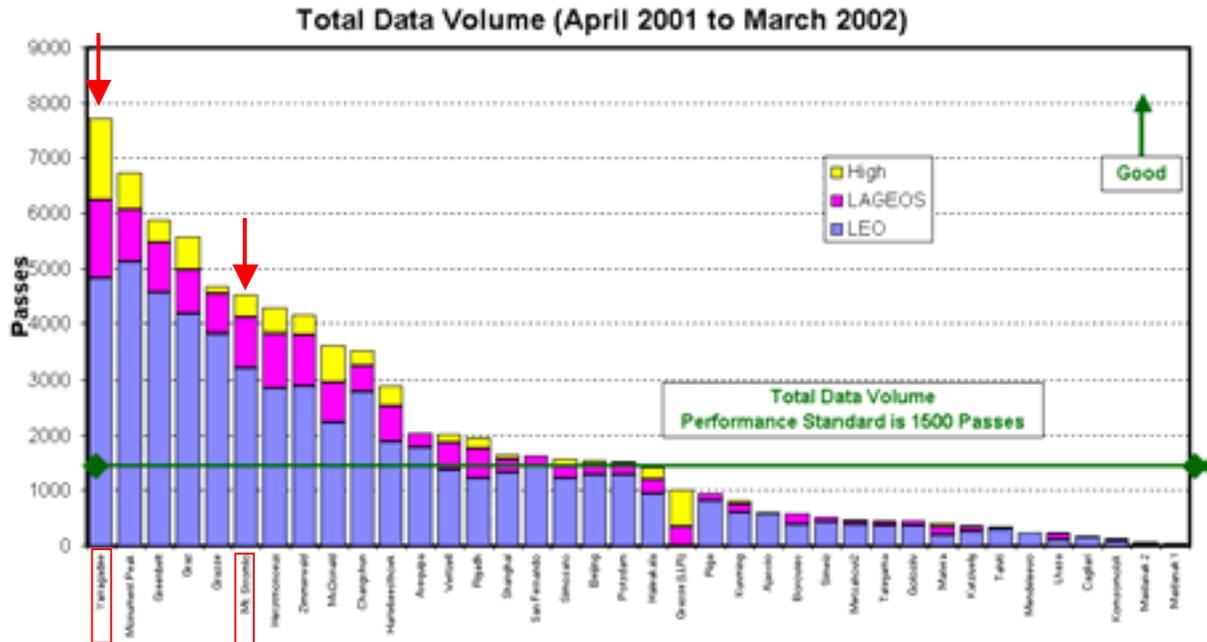
August 16-22, 2001

Satellite	P-PET rms (mm)	SLR rms (mm)	Time bias (us)	Range bias (ns)
Starlette	7.5	12.7	0.1	0.02
Beacon-C	9.3	13.8	0.1	0.00
Ajisai	10.9	15.9	0.1	0.00
Lageos 2	10.5	17.3	0.1	-0.01
Starlette	9.0	15.1	0.1	0.03
Lageos 1	8.5	14.2	0.1	0.01
Beacon C	19.2	19.7	0.1	0.02
Topex	22.4	35	0.1	0.00
Topex	4.9	10.8	0.1	0.00
Lageos 1	7.0	13.5	0.1	0.00
Stella	6.1	12.4	0.1	0.00
Beacon C	10.0	16.1	0.1	0.00
Starlette	8.4	12.9	0.1	0.01
Westpac	--	16.6	0.1	0.03
Lageos 2	8.5	16.1	0.1	0.00
ERS-2	4.0	10.5	0.1	0.01
mean			0.1	0.01

3. Australia

3.1 Station performance

Both Australian stations continue to perform to a high standard, as indicated by the graph below, extracted from the recent ILRS performance report (ilrs.gsfc.nasa.gov/perf_2002q1.html).



3.2 SLR Analysis

Geoscience Australia continues analysis as part of the ILRS Working Group pilot project. A 1994-2002 solution for EOP was submitted to IERS for EOP in the frame of ITRF2000.

3-day arc solutions for range and time bias continue to be provided on a regular basis and are available from www.auslig.gov.au/geodesy/sgc/product.htm.

3.3 Local Tie Surveys

Geoscience Australia has conducted a number of high accuracy local surveys at Stromlo and Yarragadee to connect the SLR invariant point (IVP) to the GPS, Glonass and Doris equipment at these sites. The results of these surveys were submitted to IERS for inclusion in ITRF2000.

Yarragadee was surveyed in August 1998 and again in May 2001 and the difference in the computed position of the IVP was of the order of 3 mm. A full description of these projects can be found in the Technical Reports (www.auslig.gov.au/geodesy/techrpts/pdf/techrep3.pdf & www.auslig.gov.au/geodesy/techrpts/pdf/techrep4.pdf).

Stromlo was surveyed in June 1999 and again in early 2002. Results of the first survey can be found in the Technical Report (www.auslig.gov.au/geodesy/techrpts/pdf/techrep3.pdf) and they compare very well (mm level) with the preliminary results of the latest survey, which are yet to be finalised.

3.4 Administrative Arrangements for Stromlo & Yarragadee

In late 2001 the Australian Surveying & Land Information Group (AUSLIG) was merged with the Australian Geological Survey Organisation (AGSO) to form Geoscience Australia. In December 2001, Dr John Luck retired from Geoscience Australia, although maintains an active interest in SLR. His experience and knowledge will not be readily replaced - at the moment he continues to provide assistance on a part time basis.

The contracts for the two Australian SLR stations continue to be managed by Geoscience Australia and its Space Geodesy Analysis Centre continues as an ILRS Associate Analysis Centre.

Contract arrangements for the Stromlo SLR station continue for at least another 18 months. The existing contract for the Yarragadee station finishes on 30 June 2002; although there is provision for an extension of the current contract, funding is a critical issue and is still subject to negotiation.

STATUS OF NASA NETWORK

- MOBLAS-4 & 7: Nominal Operations.
- MOBLAS-5 (Australia): Nominal Operations. Perform some single operator tracking which increased data volume.
- MOBLAS-6 (South Africa): Nominal Operations. Also perform some single operator tracking.
- MOBLAS-8 (Tahiti): Training/Tracking Status. In the process of training the two new crew members.

STATUS OF NASA NETWORK (Cont.)

- TLRS-3 (Arequipa): Nominal Operations.
- HOLLAS (Hawaii): Engineering Status. In the process of completing the telescope control system upgrade.
- MLRS (Texas): Nominal Operations.

Lunar Laser Ranging

- Routine LLR observations continue at OCA and MLRS
- New station at Matera, Italy is undergoing LLR "shake-down"
- LLR-related activity at Apache Point, NM is quite encouraging
- Significant new work on the lunar interior using LLR data
 - Two LLR-related papers at Lunar and Planetary Science XXXIII (2002)
 - Lunar Love Numbers and the Deep Lunar Interior (Jim Williams, Dale Boggs, Tom Ratcliff and Jean Dickey at JPL
 - The "Core" of the Moon: Iron or Titanium Rich? (Mark Wieczorek and Maria Zuber at MIT)
- General relativity, gravitational theory, solar system dynamics work continues
- Coordinated Transponder/LLR/SLR "predicts" under active development

Apache Point Update

- Trip to MLRS in March. Good information exchange.
- Laser ordered. Optimistically looking forward to sending first photons skyward before the close of this year.
- Presently concentrating most intently on detector and timing electronics.
- Trip to MLRS reinforced their belief that that a 3.5-m telescope and 1 arcsec image quality, will produce a high photon-rate regime, able to achieve millimeter precision in a matter of minutes.
- Quoting Tom Murphy: "Exciting times, and I can't wait to get it all going".



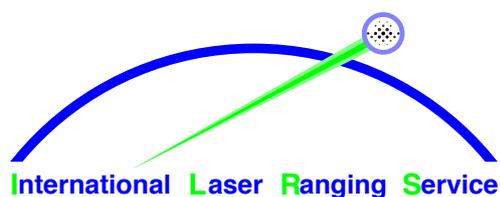
Data Center Report

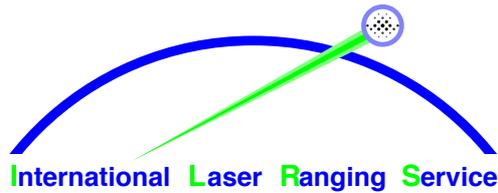
ILRS Global Data Center Report/EDC

W. Seemüller



ILRS General Assembly, Nice, 25. April 2002





ILRS Global Data Center Report / EDC

Wolfgang Seemüller

- **Check of successful hourly normal point data delivery between HTSI/CDDIS and EDC, and vice versa**
- **Backup procedures for ILRS prediction exploder are implemented at EDC**
 - **Backup procedures for IRVs of HTSI are implemented at EDC**
 - **Backup procedures for daily and subdaily IRVs, and Time Bias Functions of NERC are implemented at EDC**
 - **Backup procedures for IRVs of CHAMP and GRACE of D-PAF/GFZ are implemented at EDC**
- **Hourly update of all onp files and summary files**



Structure of directory pub/laser (EDC ftp server)

pub / laser / qldata /

- hourly
- hourly_global
- hourly_htsi
- envisat
- gracea
- graceb
- .
- .
- satname
- .
- .

predictions /

- DPAF_PRED
- RGO_PRED
- CHAMP_PRED
- MCC_PRED
- NASDA_PRED
- GRACE_PRED
- ESOC_PRED

timebias
npdata
frdata
eccentricities
calibrations
occupations
coordinates
products
solutions
station /
messages /
reports
software
formats
cdis
dpaf
htsi
ancillary
summaries
salro
stromlo

sch, sci, log
slrmail, slreport

SLRmails and SLReports per month since Nov. 1995

